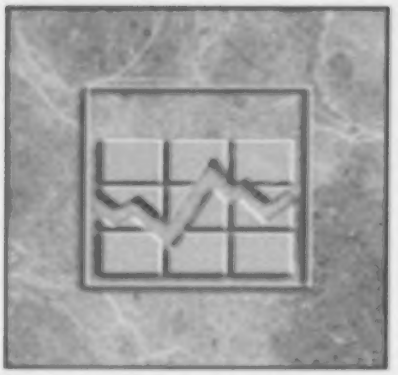
Catalogue no. 75-004-M — No. 004

ISBN 978-1-100-25076-2

Labour Statistics: Research Papers

Impact of the local unemployment rate on permanent retirement



by Diane Galarneau, Martin Turcotte, Yves Carrière and Eric Fecteau

Release date: April 22, 2015

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.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E}	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

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Impact of the local unemployment rate on permanent retirement

by Diane Galarneau, Martin Turcotte, Yves Carrière and Eric Fecteau

Introduction

In the current context of population aging and the continuing increase in life expectancy, delayed retirement appears to be an important element of economic growth for decades to come (Burniaux et al. 2004; Expert Panel on Older Workers 2008; Denton and Spencer 2010; Castonguay and Laberge 2010). Since the mid-1990s, delayed retirement has been observed among both men and women, regardless of education level. In 2009, employed Canadians aged 50 could expect to retire at around 64 years of age, compared with just under 62 in the mid-1990s[1] (Carrière and Galarneau 2012b).

The decision to retire is a complex process, which depends on a set of factors such as an individual's financial situation, personal aspirations, health, demographic characteristics (age, sex, immigrant status), employment conditions throughout an individual's labour-force participation, family status at the time of retirement and any changes in this regard, as well as unforeseen events such as the loss of a spouse, an accident or an unexpected financial gain (Schellenberg and Ostrovsky 2008).

The local unemployment rate[2] is another element to consider. A number of studies have shown that layoffs increase the probability of retirement among older workers (Chan and Sewin 1999, 2002; Coile and Levine 2009, 2010; Bosworth and Burtless 2011; Gustman, Steinmeier and Tabatabai 2011). As such, one can assume that a high unemployment rate could have the same effect.

Furthermore, in areas where the unemployment rate is high, older workers could be more likely to lose their job and to have difficulty re-entering the labour force. As a result, they may retire earlier than their counterparts in areas with lower unemployment. In such cases, older workers in areas of high unemployment may face a two-fold risk: that of retiring early, and being less prepared for retirement. They may therefore have to rely on a lower retirement income than anticipated.

With the implementation of various government measures designed to encourage older Canadian workers to remain employed,[3] it is important to determine the impact of local economic conditions on retirement decisions, so that this factor can also be taken into consideration in the development of public policy.

This article begins with a look at the changes in expected retirement age in Canada since 1991. This indicator is derived from expected working life, which is a concept similar to that of life expectancy, and which takes into account not only probabilities of death but also probabilities of retirement (see **Data sources, definitions and method**). This indicator has already been estimated from the Labour Force Survey (LFS) (Carrière and Galarneau 2011, 2012a, 2012b). For the purpose of this study, we used the Longitudinal Administrative Databank (LAD), a large dataset permitting the analysis of expected age of retirement for detailed level of geography.

To estimate the impact of local unemployment rates, we divided economic regions (ERs) into three separate groups, according to their average annual unemployment rate (low, moderate or high). Expected retirement age is presented for these three ER groups, as well as for the major ERs of Montréal, Toronto, Calgary and Vancouver and by province.

The expected age of retirement is an indicator with numerous advantages;[4] however, it is an aggregated average and can mask the effect of certain factors. Therefore, as a second step, in order to isolate the impact of the local unemployment rates on the precise retirement age, a survival model was used to estimate the probability of retirement for each year of age

1. The calculation of the expected retirement age depends on the selected assumptions. The figures presented here take into account both voluntary and involuntary retirements (under certain assumptions). See Carrière and Galarneau (2011) for further details.
2. In this article, local unemployment rate means that of the economic regions (ER). This indicator has been used to identify the impact of local economic conditions on the probability of retirement. Other indicators could be used; see Choosing the unemployment rate variable in **Data source, definitions and method**.
3. We are referring here to the gradual increase in the age of eligibility for Old Age Security benefits, aged 65 to 67, as of 2023, as well as the provision that enables older workers to start receiving pension benefits under the Canada Pension Plan and the Régime des rentes du Québec, while continuing to work.
4. As shown by Carrière and Galarneau (2011), one of the main advantages of this indicator is that it can be used to monitor trends in the retirement behaviour of not only Canadians who have retired (as is the case with the average retirement age), but also of those who have not yet retired. Moreover, expected retirement age is not affected by the age composition of persons aged 50 and over.

between 50 and 61. The selection of this age group is related to the definition of retirement used in this article and to the observation period for the LAD. Thus, the impact of local unemployment rates can be estimated for cohorts born between 1941 and 1946, between the ages of 50 and 61.

Because the LAD is an administrative databank, it does not explicitly identify the taxpayers who have retired. Therefore, this article also includes a methodological section comparing various definitions of retirement based on a range of earnings thresholds. These results are also compared with those obtained from the LFS.

Section I: Trends in expected retirement age

Delayed retirement: a clear trend

One of the indicators used in this article is expected retirement age, which is calculated from the expected working-life tables. To create these tables, it is first necessary to identify retirements. Because the LAD does not contain any information on transitions towards retirement, a number of definitions were tested, and are presented in **Measuring expected retirement age using LAD taxation data**.

However, only one definition has been chosen for the purposes of this article, and it is based on an employment earnings threshold of $5,000 (in 2011 constant dollars).[5] We have adopted a strict definition of retirement whereby an individual needs to be out of the labour force for a minimum of four years to ensure that temporary work interruptions due to layoff or illness are not considered as retirement. For the purposes of simplicity, these retirements are designated as "permanent" even though, in fact, this is not always the case (see **Data source, definitions and method**). The definition of retirement is, therefore, as follows:

> *In the universe of people aged 50 and over, individuals are considered to be "employed" if their employment income is over $5,000; if an individual's income drops below this threshold and remains there for at least four years, the individual is considered to be retired.*

On the basis of this definition, expected working-life tables were created to enable us to calculate expected retirement age across Canada and for different levels of geographic detail.

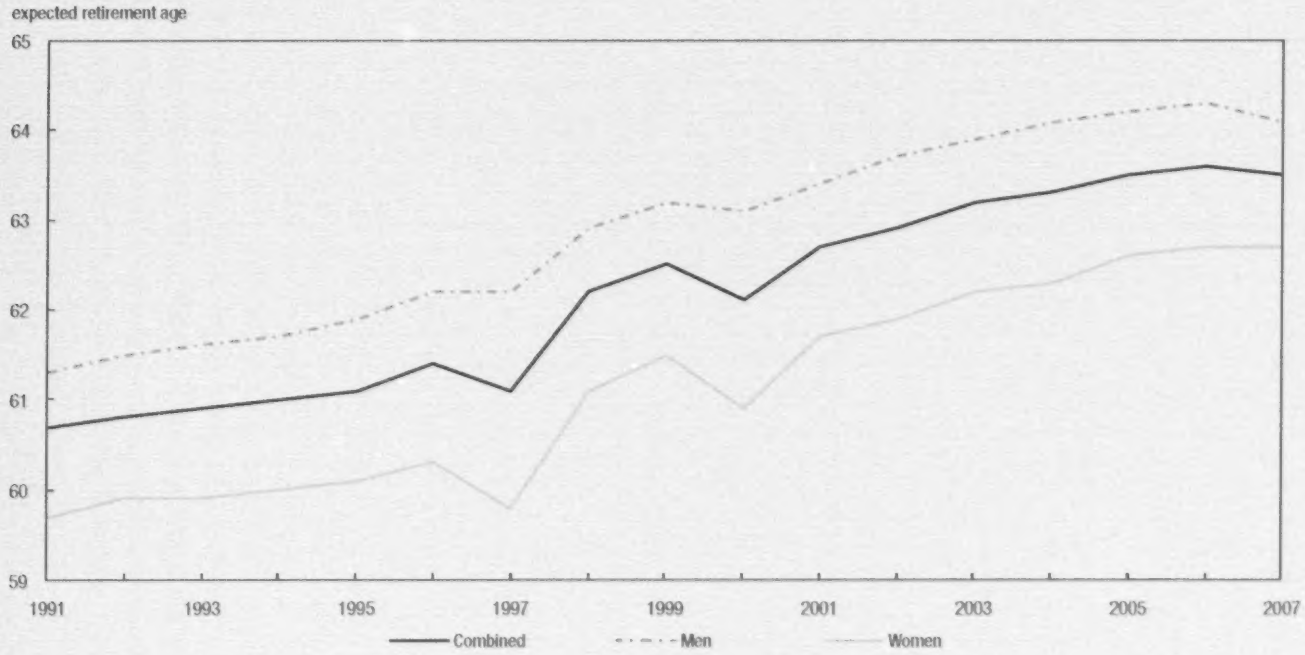
The results show that, from 1991 to 2007,[6] the expected 'permanent' retirement age in Canada rose from 60.7 to 63.5,[7] an increase of nearly three years (Chart 1). For men, it was up from 61.3 to 64.1 and for women, from 59.7 to 62.7. There is a clear trend in delayed retirement, which can be observed from LFS data (Carrière and Galarneau 2011) as well as, in this case, LAD data.

5. All dollar values in this article have been converted to 2011 constant dollars.

6. The LAD covers the period from 1982 to 2011, but the series on retirement pertains to the period from 1991 to 2007. Before 1991, the introduction of various tax credits gave rise to a change in the composition of tax filers, possibly creating a bias. The series ends in 2007, given that permanent retirement requires absence from the labour force for a minimum of four years.

7. Expected retirement age calculated on the basis of the LAD is slightly different from that calculated from the LFS. For further details on these differences, see **Measuring expected retirement age using LAD taxation data**.

Chart 1
Delay in permanent retirement[1] for men and women since 1991



1. This chart is based on a strict definition of retirement that requires retirement from the labour force for a minimum of four years.
Source : Statistics Canada, Longitudinal Administrative Databank (LAD), 1991 to 2011.

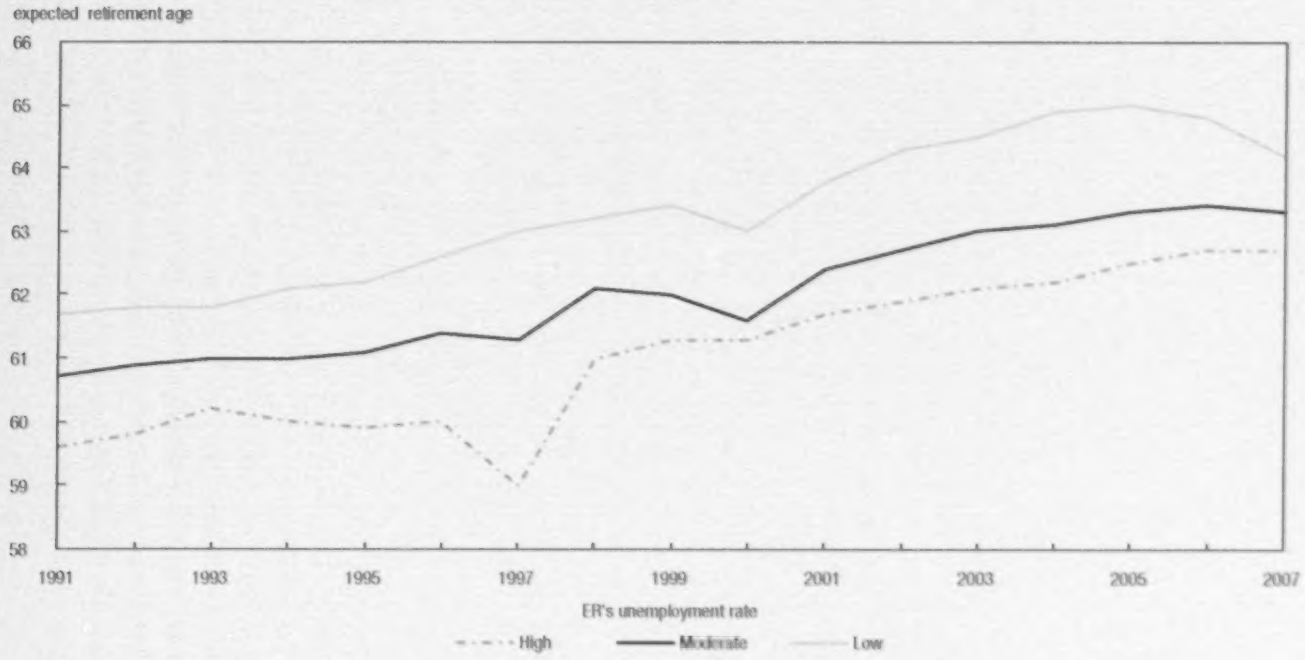
Low unemployment rates appear to be linked to a higher retirement age

To identify the effect of the local unemployment rate[8] on the expected age of permanent retirement, we used the average annual unemployment rate for the population aged 15 and over from the LFS for each ER. Although retirement applies only to workers aged 50 and over, the unemployment rate for the working-age population as a whole was chosen because it is representative of overall economic conditions in each ER. Moreover, because this indicator is based on a larger group, the data are less volatile.

Canada's 73 ERs were then divided into three separate groups, depending on whether their unemployment rate was low, moderate or high. These groupings are not static in time, and some ERs may move to a different group from one year to the next, depending on trends in their unemployment rate.[9] We then calculated the expected retirement age in these three ER groups (Chart 2).

8. See Note 2.
9. Because not all ERs are the same size or have the same demographic weight, the three ER groups do not represent the same proportion of the working-age population, even though they comprise roughly the same number of ERs. In general, regions with low unemployment account for approximately one-quarter of Canada's working-age population, compared with 50% for ERs with moderate unemployment and 25% for ERs with high unemployment.

Chart 2
Expected permanent retirement age[1] higher in ERs with low unemployment



1. This chart is based on a strict definition of retirement that requires retirement from the labour force for a minimum of four years.
Note: ER stands for economic region.
Source: Statistics Canada, Longitudinal Administrative Databank (LAD), 1991 to 2011.

The LAD shows that between 1991 and 2007 the average retirement age differed by more than two years between regions with high and low unemployment rates. The gap was lowest (1.5 years) in 2007. For this year, a worker in a high-unemployment region could expect to retire at the age of 62.7, compared with 64.2 for a worker in a region with low unemployment. These results therefore support the hypothesis that older workers in regions with fewer employment opportunities are more likely to retire earlier.

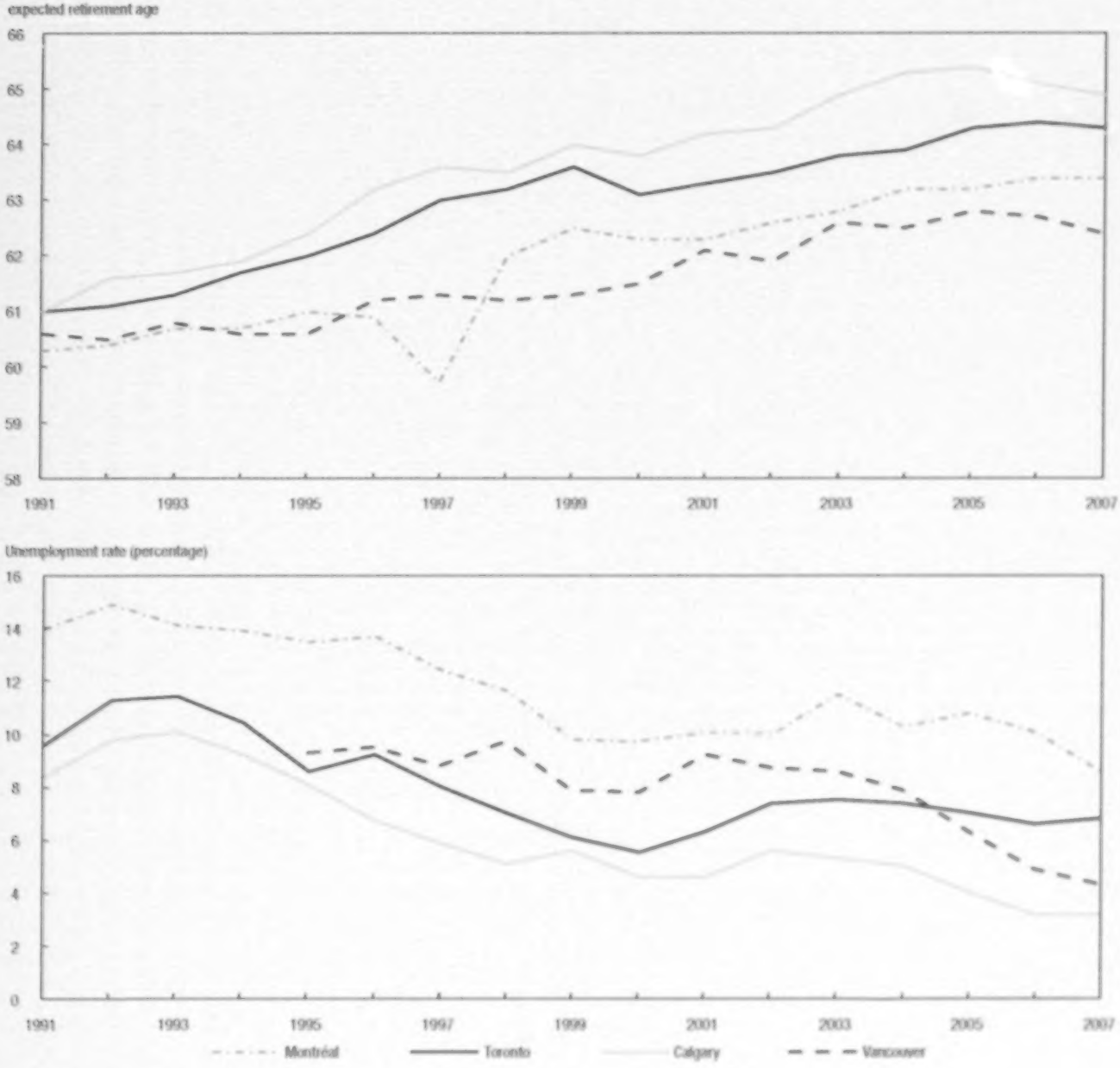
Delayed retirement is also observed in the three ER groups. In the regions with low unemployment, the expected retirement age increased from 61.7 to 64.2; in regions with moderate unemployment, from 60.7 to 63.3; and in regions with high unemployment, from 59.5 to 62.7.

Similar relationship for Montréal, Toronto, Calgary and Vancouver ERs

The large number of observations from the LAD makes it possible to calculate the expected permanent retirement age for certain ERs, such as Montréal, Toronto, Calgary and Vancouver. Thus, it can be seen that this indicator has increased in each of these ERs since 1991, and delayed retirement can, therefore, be observed in these four major ERs in Canada.

In 2007, the expected retirement age was higher in Calgary, followed by Toronto, Montréal and Vancouver. This ranking was preserved throughout almost the entire period, from 1998 to 2007 (Chart 3), and is inversely related to unemployment rates over a large part of the period, from 1995 to 2005.

Chart 3
Calgary had the highest expected permanent retirement age[1] and the lowest unemployment rate



1. This chart is based on a strict definition of retirement that requires retirement from the labour force for a minimum of four years.
Note: ER stands for economic region. Data for Vancouver are not available before 1995.
Source: Statistics Canada, Longitudinal Administrative Databank (LAD), 1991 to 2011. *Labour Force Survey*, 1991 to 2007.

These findings tend to support the hypothesis that workers in weaker local labour markets are pushed towards retirement earlier than their counterparts in more dynamic regions. For example, the Calgary ER posted the lowest unemployment rate and the highest expected retirement age throughout the entire period. This ER was also part of the low unemployment group in the ER classification.

However, the relationship is not entirely linear. For example, the retirement age for the Vancouver ER was lower than that of Montréal[10], but the unemployment rate was also lower. This simply shows that economic conditions are not the only factor that has a bearing on retirement age.

It is important to point out that expected retirement age is higher than it was previously for each unemployment rate level. Therefore, one should not assume that the expected retirement age is higher today simply because the unemployment rate has decreased.

The expected permanent retirement age is higher in the Prairies

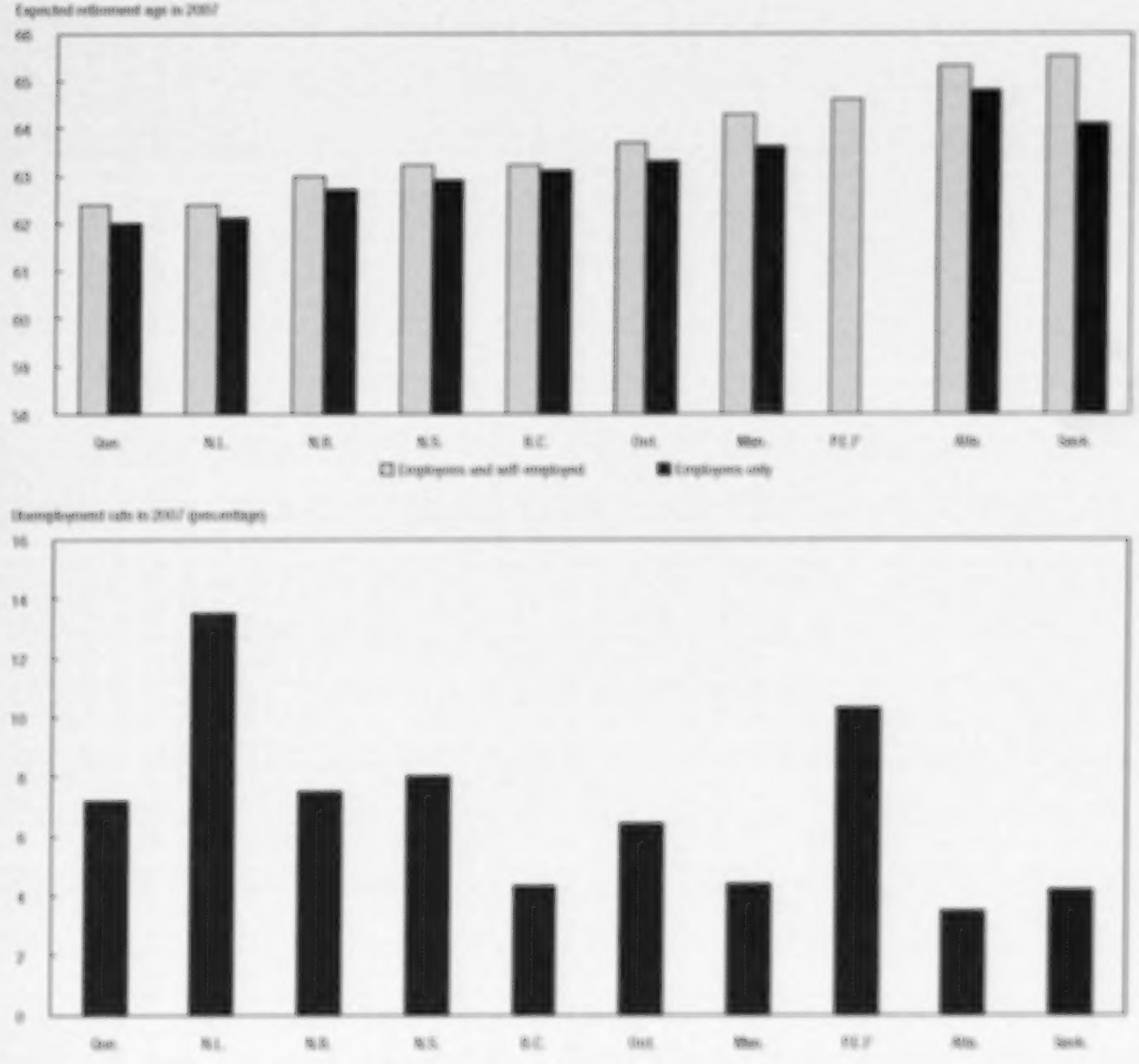
The relationship between expected retirement age and unemployment rates can also be analysed by province (Chart 4). In 2007, for example, the Prairie provinces (Manitoba, Saskatchewan and Alberta) posted the highest expected retirement age (between 64.3 and 65.5) and the lowest unemployment rate in the country (between 3% and 4%). Québec and three Atlantic provinces (Nova Scotia, New Brunswick and Newfoundland and Labrador) experienced higher unemployment (between 7.0% and 13.0%), along with expected retirement ages that tended to be lower (between 62.4 and 63.2).

However, the relationship is less clear for certain provinces. For example, the expected retirement age in Saskatchewan was higher than that of Alberta, but Saskatchewan's unemployment rate was lower; Quebec's expected retirement age was relatively low compared with Ontario (62.4 and 63.7 respectively), but unemployment rates in the two provinces were fairly close in 2007 (7.2% and 6.4%).

Other factors affect retirement age, and some of the differences among provinces might also be related to compositional effects. For example, the proportion of workers in a province who hold agricultural occupations, or who are self-employed, may lead to an increase in the expected retirement age (since they retire later). When self-employed workers are excluded, the expected retirement age decreases in all provinces, but particularly in certain ones that have a proportionally higher number of self-employed workers, such as Saskatchewan and Manitoba (Chart 4).

10. The strong drop in 1997 for Montreal ER, which was also observed for the whole province of Québec, could be linked to the high number of retirements in the public sector that happened on that year which increased by 34 % from 1996 compared to annual increases of less than 10 % for the other years (special calculations from CARRA).

Chart 4
Alberta and Saskatchewan have the highest expected permanent retirement ages[1]



1. This chart is based on a strict definition of retirement that requires retirement from the labour force for a minimum of four years.
2. Trends of the expected retirement age cannot be plotted for "employees only" in Prince Edward Island, because of the small sample size.

Sources: Statistics Canada, Longitudinal Administrative Databank (LAD), 1981 to 2011; Labour Force Survey, 2007.

Section II: Modelling

The effect of the unemployment rate on permanent retirement is confirmed

The local unemployment rate appears to influence the decision to retire, based on our examination of general trends in the expected age of retirement and its association with unemployment rates by ER. At the same time, however, there are many other factors which influence ones decision to retire. To ensure that the relationship remains significant, once these factors have been taken into account, we estimated a survival model (See *Survival model to estimate probability of retirement* in **Data sources, definitions and method**).

These models look at the probability of retirement for each year of age before 62 years old, i.e., between 50 and 61. The choice of these ages is based largely on the definition of retirement adopted in this article (which requires retirement from the labour force for a minimum of four years), which limits the observation period to the years between 1991 and 2007, given that the LAD covered the period up to 2011, at the time of writing. This makes it possible to assess the impact of the unemployment rate on the probability of retirement for a set of cohorts born between 1941 and 1946, starting at age 50. The results pertain to employees[11] who were earning $15,000 or more at age 50, and whose earnings were higher than this level for at least six of the nine years before they turned 50. This is to avoid including tax filers with a marginal attachment to the labour force.[12]

Initially, "simple models"—taking into account only age and the unemployment rate of the ER of residence—were estimated using the average annual unemployment rate (as a continuous variable) for each ER taken from the LFS.[13] Subsequently, more complex models comprising a set of variables that could influence workers' behaviour at retirement were estimated.[14] For each year of age, the model estimates the probability that a worker will retire on the basis of his/her various characteristics. Given that these factors can have a different impact for men and women, separate models were estimated for each sex.

According to the results of the simple models (Chart 5), very few workers retire between the ages of 50 and 54, meaning that the probabilities of retirement are very low (close to 0%). They are also very similar at these ages, regardless of sex or unemployment rate. However, the difference in the probabilities of retirement becomes more pronounced at older ages.

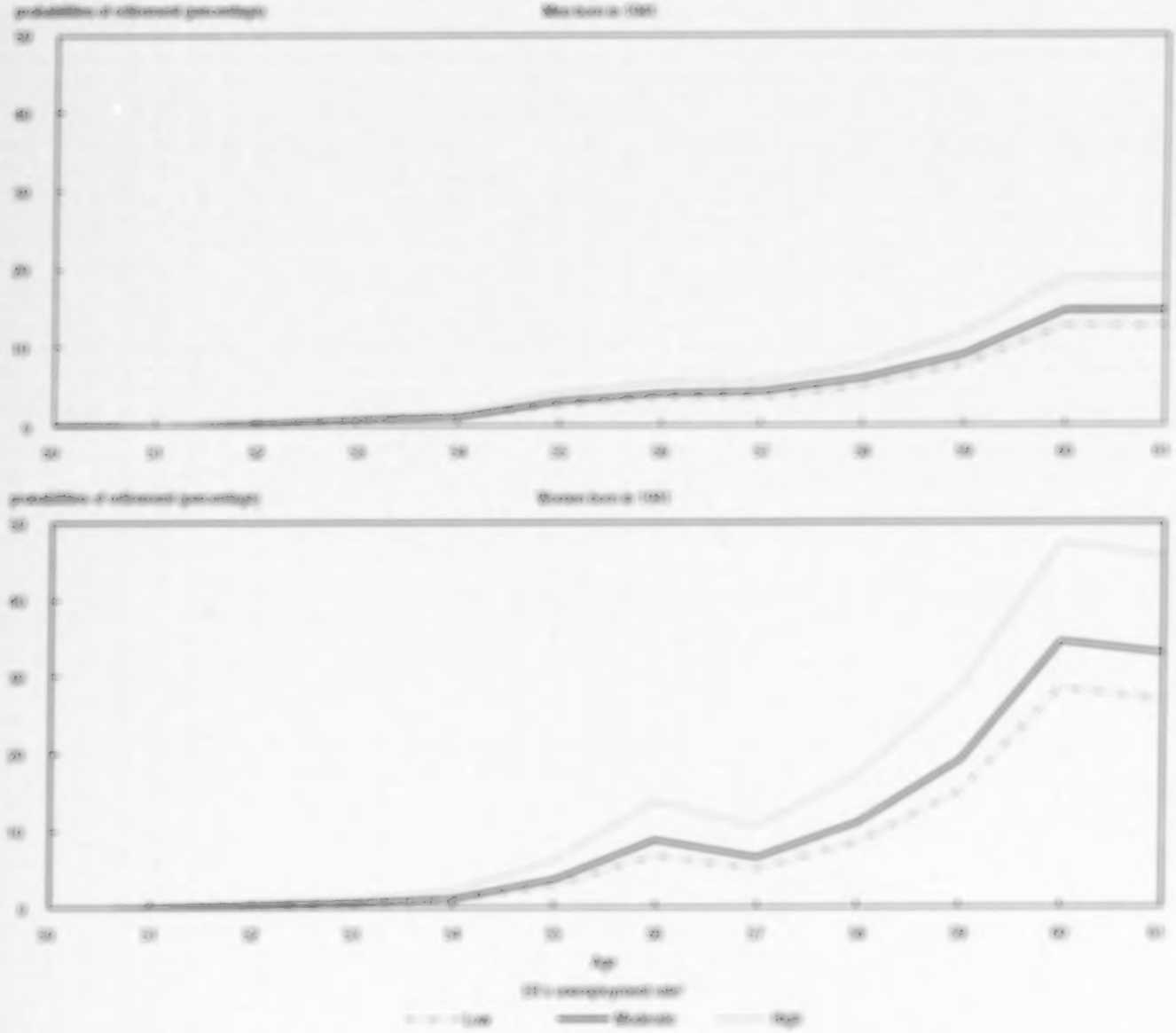
11. Tax filers with self-employment income, at age 50, were excluded given that their history and characteristics often differ from those of other workers. Employees who became self-employed after age 50 were, nonetheless, kept in the sample, and this factor was taken into account in the model.

12. Models were also estimated without this $15,000 limit, which equated to the universe used in the calculation of expected retirement age in the previous section. These models yielded similar results.

13. Note that the unemployment rate for people between the ages of 20 and 49 has been used in the models to avoid introducing endogeneity between this variable and that on receiving employment insurance benefits by people aged 50 and older. In the previous section, which deals with expected retirement age, ERs were classified according to the unemployment rate of people aged 15 and older. Whether we used the unemployment rate for people aged 15 and older or the rate for those between 20 and 49 had no bearing on the results in terms of expected retirement age or in the survival models.

14. The list of these variables was limited by those available in the LAD. The list is as follows: conjugal status, disability (reflected by claiming the disability credit), collection of employment insurance benefits during the year, unionization, an indicator of self-employment during the year (yes or no), socioeconomic status (as measured by an individual's cumulative personal income between 1982 and 1991), and the number of years of contribution to a pension plan.

Chart 3
The probability of permanent retirement[1] higher in CMs with a high unemployment rate, regardless of the age between 55 and 61 (simple model)[2]



1. A strict definition of retirement requiring retirement from the labour force for a minimum of five years has been adopted here.
2. The simple model estimates the probability of retirement before age 62 and includes only age and unemployment rate of the CD of residence as variables.
3. Low, moderate and high unemployment rates vary for each cohort depending on the unemployment rates to which they have been exposed. The cohort born in 1941 has respective average rates of 6.0%, 8.0% and 12.0%.

Note: CD stands for economic region.
Source: Statistics Canada, Longitudinal Administrative Databank (LAD), 1991 to 2011.

For example, at age 61, the probability that a woman from the 1941 cohort who is still employed would retire at that age was 45.5% if she resided in an ER with a high unemployment rate.[13] In comparison, the probability decreased to 27.0%

13. Low, moderate and high unemployment rates vary for each cohort. For example on average, for people born in 1941, low unemployment meant a rate of 6.0%, a moderate rate was 8.0% and a high rate was 11.0%. These rates were on a downward trend given the overall improvement in employment conditions between 1991 and 2007. For the cohort born in 1946, low, moderate and high unemployment rates were on average as follows: 5.8%, 7.8% and 11.8% respectively.

for a female worker of the same age and from the same cohort who resided in a region with a low unemployment rate. For men, the probabilities ranged between 18.8% and 12.8% for the same cohort. Consequently, these results confirm, through a different methodology, those previously presented on the basis of expected retirement age.

The cumulative probability of retirement illustrates the extent to which residing in a region with a high unemployment rate is associated with the likelihood of leaving the labour market before age 62. For example, for women born in 1957, who resided in an EIR with high unemployment, the probability was 68.2% (Table 1); in other words, close to 7 out of 10 women in these regions retire before age 62. In comparison, the probability was 55.0% for their counterparts in EIRs with low unemployment, representing a difference of over 20 percentage points. For men, the gap was approximately 10 percentage points (58.1% in an EIR with high unemployment, compared with 47.3% in an EIR with low unemployment).

Table 1
Cumulative probabilities of permanent retirement[1] before age 62, by sex and birth cohort, simple models[2]

	1954	1956	1958	1960	1962	1964
	Probabilities[3] (percentage)					
Average annual unemployment rate of EIRs[4]						
Men						
Low	51.3	49.8	48.2	47.0	47.0	48.6
Moderate	56.2	54.9	54.2	53.1	53.0	55.1
High	62.1	62.2	60.2	58.1	58.2	61.6
Women						
Low	55.0	52.8	51.1	51.6	49.8	52.9
Moderate	59.8	59.0	58.8	58.1	55.2	57.9
High	68.2	66.3	7.3	65.6	65.1	69.6

1. Public or private plan. All retirement reasons combined. Those who are unemployed at their regular retirement age are considered retired.
2. The simple models estimate the probability of retirement before age 62 as a function of the unemployment rate in the EIR of residence at the time of the survey, controlling for sex and birth cohort.
3. Although the table presents cumulative probabilities for unemployment rate levels (low, moderate and high), these probabilities were estimated on the basis of the continuous unemployment rate variable. For more information, see "Data sources, definitions and context".
4. All pooled Wald χ2 tests were significant at the 1% level or under.

Note: EIR (census metropolitan area).
Source: Statistics Canada, Longitudinal Administrative Databank (LAD), 1982 to 2011.

Through full modelling, it was possible to test the robustness of these results, taking into account other individual characteristics that could be associated with retirement before age 62. These characteristics could be correlated with the unemployment rate in the regions, and failing to take them into account could overstate the impact of the unemployment rate on retirement before age 62.

Incorporating all of the individual characteristics decreases the influence of the unemployment rate. For example, for women born in 1957 and residing in a region with high unemployment, the probability of permanent retirement before age 62 fell from 68.2% (Table 1) to 7.6.3% (Table 2) while other factors remained constant. Among their male counterparts, it dropped from 58.1% to 48.3%.

Despite the decrease, an EIR's unemployment rate remains a significant factor once we control for all of the individual characteristics. This finding applies to most of the cohorts of men and women studied (except for the cohort of men born in 1948): the higher the unemployment rate of the region in which an employee resides, the greater the probability the employee will retire before age 62. The gap between the probabilities of retirement for EIRs with low versus high unemployment rates remains significant as well, except for men from the 1948 cohort (Table 2).

These results, which reveal that the unemployment rate has a significant impact, are consistent with those of a number of U.S. studies that looked at the impact of the 2008 recession, and also found that high unemployment rates spurred early retirement (Coile and Levine 2009, 2010, 2011; Quinlan, Steinmeier and Tabatabai 2011; Bosworth and Burtless 2011). Moreover, they are in line with those of Canadian studies on the impact of a layoff on older workers' decisions about retirement, which also found this to be an incentive to early retirement (Friesen and Gray 2011; Nell and Schirle 2009; Chan and Stevens 1999, 2002).

Nonetheless, it should be noted that, irrespective of the unemployment rate, the probability of retiring before age 62 is lower for the more recent cohorts. We observed a decline in probability over time that tends to be more significant in regions with high unemployment. For men, the probabilities of permanent retirement decreased by 20%, from 48.3% to 38.6%. For women, the decline was similar at close to 21%, with the probabilities falling from 7.6.3% to 51.6%.

Table 5

Cumulative probabilities of permanent retirement before age 62, by (3) unemployment rate, men and birth cohort, full model[1]

	(1956)	(1958)	(1960)	(1962)	(1964)	(1966)
(3) unemployment rate	Predicted cumulative percentages					
Men						
Low						
Moderate	37.0	38.8	39.8	34.8	38.0	38.0
High	37.1	37.9	38.1	34.1	37.9	38.1
Severe	36.2	36.9	37.3	33.4	36.1	36.4
Low						
Moderate	35.9	36.7	37.6	33.2	36.0	36.6
High	35.8	36.6	37.5	33.0	36.0	36.6
Severe	35.1	35.8	36.6	32.1	35.0	35.6

1. Probabilities are calculated for each individual in the sample, using the coefficients from the full model (Table 4.A1.1, column 3), and then averaged over the sample. Probabilities are calculated for a man with the characteristics of the average man in the sample, except for the variables of interest (birth cohort and unemployment rate). Probabilities are calculated using a complementary log-log model.
2. Unemployment rate refers to the unemployment rate in the province of residence at age 60. Low unemployment is defined as the unemployment rate in the province of residence at age 60 being less than 6%. Moderate unemployment is defined as the unemployment rate in the province of residence at age 60 being between 6% and 8%. High unemployment is defined as the unemployment rate in the province of residence at age 60 being between 8% and 10%. Severe unemployment is defined as the unemployment rate in the province of residence at age 60 being greater than 10%.

Note: All results are rounded to one decimal.

Source: Statistics Canada, Longitudinal Administrative Databases (LAD), 1982 to 2014.

Table 6

Probability of permanent retirement at age 61 for employees still working at first age, 1961 and 1965 cohorts (complete models[1])

	Men		Women	
	1961	1965	1961	1965
(3) unemployment rate	Predicted probability of retirement at age 61, percentages			
Low				
Moderate	10.2	9.4	10.0	9.4
High	11.0	9.4	10.6	10.1
Severe	10.0	9.6	10.0	10.0
(4) province of residence				
Atlantic provinces	17.6	15.5	15.6	15.5
Quebec	11.0	9.4	10.1	11.1
Ontario	11.0	9.4	11.0	11.1
Manitoba / Saskatchewan	10.0	7.0	9.6	9.6
Alberta	7.5	5.6	6.1	7.5
British Columbia	10.9	9.7	10.6	9.9
(5) sex				
Men	10.0	9.6	10.1	10.1
Women	10.9	9.7	10.1	10.1
(6) marital status				
Married	10.0	9.6	10.1	10.1
Not married	10.9	9.7	10.1	10.1
(7) education				
Less than high school	10.0	7.0	10.1	10.1
High school	9.0	9.6	9.7	9.9
Post-secondary	10.9	11.0	10.7	10.1
(8) employment history				
Low	11.1	9.9	10.9	10.9
High	10.9	9.0	10.0	10.1
(9) retirement savings, dummy				
Lower quintile (Q1)	9.9	9.9	10.9	10.9
Q2	11.0	7.9	10.0	10.0
Q3	11.0	11.1	10.1	10.9
Q4	10.9	9.7	10.1	10.9
Upper quintile	11.1	9.9	10.7	10.9
(10) number of years of contributions to a private pension plan				
0 (Q1)	9.9	7.0	10.1	10.9
1 to 10 years	11.0	9.9	10.1	10.9
11 to 20 years	10.9	10.9	10.9	10.9

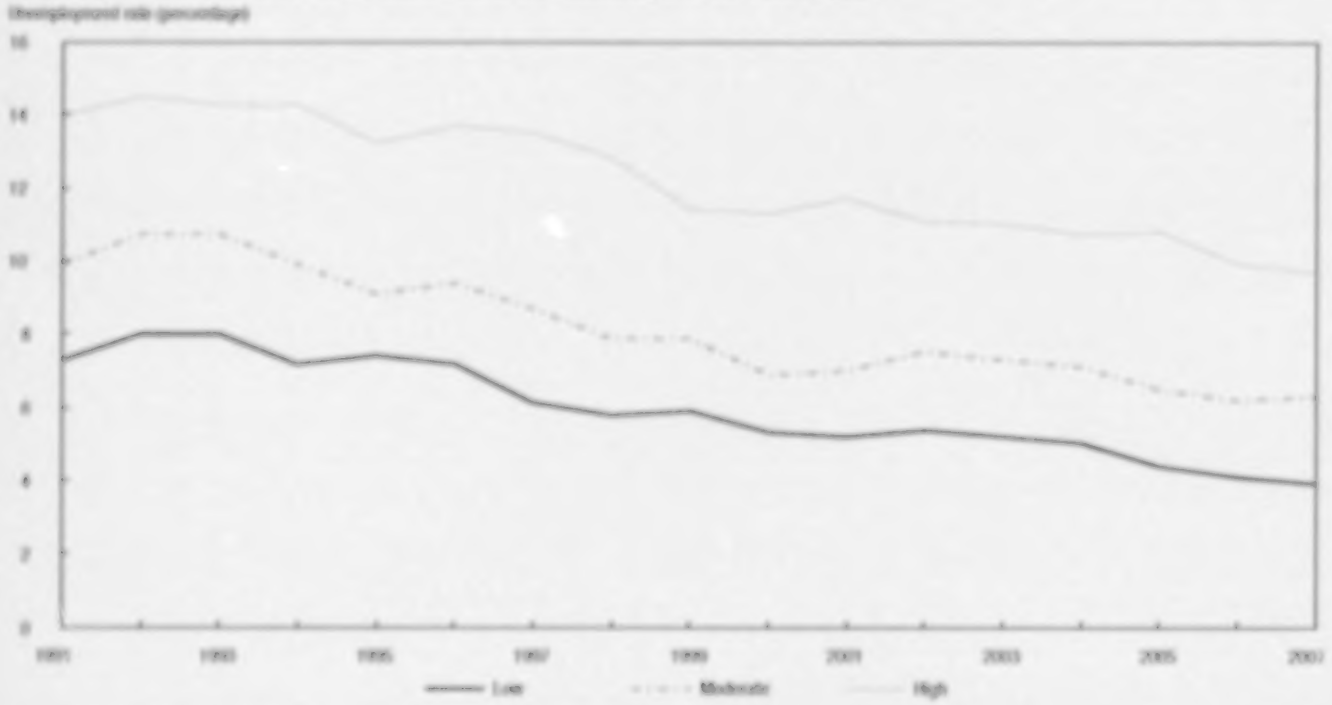
1. Each individual's probability of retirement is calculated for each age, and then averaged over the sample. Probabilities are calculated for a man with the characteristics of the average man in the sample, except for the variables of interest (birth cohort and unemployment rate). Probabilities are calculated using a complementary log-log model.
2. Unemployment rate refers to the unemployment rate in the province of residence at age 60. Low unemployment is defined as the unemployment rate in the province of residence at age 60 being less than 6%. Moderate unemployment is defined as the unemployment rate in the province of residence at age 60 being between 6% and 8%. High unemployment is defined as the unemployment rate in the province of residence at age 60 being between 8% and 10%. Severe unemployment is defined as the unemployment rate in the province of residence at age 60 being greater than 10%.

Note: All results are rounded to one decimal.

This more significant decline in regions with higher unemployment narrowed the gap between regions with low versus high unemployment, in terms of the probability of retiring before age 62. For women born in 1941, the difference was 21.2 percentage points, while for those born in 1946 it was 8.7 percentage points. For men the gap was lower: from 11.0 percentage points to no difference (the "unemployment rate" variable was not significant for this cohort).

The overall improvement in labour market conditions observed, since the second half of the 1990s, could partly explain this decrease, as it reduced the differences in the unemployment rate among ERs (Chart 6), thus making the effect of the unemployment rate more difficult to identify in a regression model.[16]

Chart 6
The unemployment rate tended to decrease from 1991 to 2007, regardless of the ER group



Notes: Population 15 and older. ER stands for economic region.
Source: Statistics Canada, Labour Force Survey, 1991 to 2007.

This may have an impact on the probability of retiring before age 62, since lower unemployment rates are associated with not only a lower probability of losing one's job but also a higher probability of finding a new one following a layoff. Lower unemployment rates could also facilitate a return to work for some retirees who decide to go back after a certain period of time.

Starting in the mid-1990s, more significant delays in retirement are observed as we move towards the more recent cohorts. For example, 49% of men and 38%[17] of women in the cohort of employees born in 1941 remained employed until at least age 62, compared with 55% and 47% of their counterparts born in 1946. This delay reflected a change in the behaviour of

16. In the wake of the 1991 recession, the average unemployment rate in Canada remained relatively high (at over 10%) until 1996, and then fell to 7% in 2007. The 1941 cohort, who turned 50 in 1991, was exposed to higher unemployment rates (ranging between 11.6% and 8.5% from 1991 to 2000) than the 1946 cohort, for which the unemployment rates varied between 9.4% and 7.0% from 1996 to 2007. This improvement was observed in all three ER groups. At the same time, variability in unemployment rates by ER (measured by the coefficient of variation (c.v.)) was less pronounced for the more recent cohorts, such as the one born in 1946 (for which the c.v. of the unemployment rate was equal to 43.8%), than for the cohort born in 1941 (for which the c.v. of the unemployment rates was 52.6%). When changes in the unemployment rate are similar across ERs, it is more difficult to identify the effect of unemployment, given that it is almost entirely captured by the "age" variable in the model.

17. These probabilities represent the reverse of the probability of retirement before age 62 (i.e., 100 – probability of retiring before age 62). These probabilities are derived from the estimation of simple models on retirement before age 62 (based on the strict definition requiring retirement from the labour force for a minimum of four years), which include only age and the unemployment rate of the ER of residence as explanatory variables.

older workers that has already been documented (Carrière and Galarneau 2011, 2012). It was likely also influenced by the end of the retirement incentives offered to members of the cohorts born between 1941 and 1945. Such incentives were offered to workers aged 50 and over at the beginning of the mid-1990s. The cohort born in 1946 turned 50 in 1996, when these incentives were no longer being offered.

A disability appears to have a more powerful impact than the unemployment rate

Although the unemployment rate has an impact on retirement before age 62, there are other variables which have a much more pronounced influence. Two factors also related to involuntary retirement had a particularly significant impact: use of the disability credit and the collection of employment insurance benefits during the year.

For example, men aged 61 who reported a disability were four times more likely to retire than those who did not (47.9% and 11.5% respectively, Table 3). Women who reported a disability during a given year were also much more likely to retire. These results are consistent with those from other studies that showed health to be a crucial factor in early retirement (Park, 2010). Nonetheless, it must be noted that fewer than 1% of workers reported a disability (and claimed the disability tax credit) at each year of age: thus, the impact is significant but remains a rare event between the ages of 50 and 61.

People who received employment insurance benefits during the course of a year were also much more likely to retire before age 62. This was especially true for women. For example, employed women in the 1941 cohort who had turned 61, and still working, had a 59.7% predicted probability of retiring at that age if they had received employment insurance benefits. This rate was three times higher than the 20% for women who had not received employment insurance, all other factors remaining constant (Table 3). Comparable differences were noted for the cohort of women born in 1946.

Belonging to a union often indicates that one's employment conditions are good, and that one is receiving a relatively high salary. The protection of a pension plan ensures a certain level of income at retirement, thus making it more affordable to leave one's job, especially in the case of a relatively early retirement. It is, nonetheless, necessary to accumulate a certain number of years of protection through a collective agreement or a pension plan for retirement before age 62 to be affordable. The model, therefore, takes this factor into account, and shows that long-standing union membership, and contribution to a pension plan for a minimum of 5 years, were also associated with a higher probability of retirement before age 62.

Lastly, the impact of living arrangements differed by sex. Men without a spouse were more likely to retire before age 62 than those who were married or divorced. On the other hand, women who were married were more likely to leave the labour market early than women who were single or divorced. This finding could reflect a cohort effect in that women's attachment to the labour market tends to increase over time. The impact of living arrangements in the model decreases from one cohort to another, as well as the difference in probabilities between various living arrangements (the difference between the probability of women living with a spouse and of those living alone, falls from close to 12 percentage points, for the cohort born in 1941, to approximately six percentage points, for the one born in 1946).

Conclusion

This article looks at the impact of local unemployment rates on retirement age using data from the LAD. Given that layoffs tend to increase the probability of retirement for older workers, we tested the hypothesis that higher unemployment rates would tend to push older workers into retirement earlier than their counterparts in ERs with stronger labour markets.

To do this, we used the average annual unemployment rates for each ER in Canada, for the population aged 15 and over. The hypothesis was initially tested with the expected retirement age, which relates to the concept of life expectancy, but takes into account not only probabilities of death but also retirement rates.

From 1991 to 2007, a difference of approximately two years was observed between the expected retirement age in regions with low and high unemployment respectively. In 2007, the expected retirement age was 64.2 in regions with low unemployment, compared with 62.7 in regions with high unemployment.

To ensure that local unemployment rates continued to have a significant impact on retirement once a series of individual characteristics had been taken into account, we used a model that evaluated the probability of retirement for six cohorts of individuals born between 1941 and 1946, who were between 50 and 61 years of age from 1991 to 2007. Taking into account the strict definition of retirement adopted in this article, and the observation period for the LAD, the model evaluated the probability of retirement before age 62 for these cohorts.

The impact of the local unemployment rate on the probability of retirement was confirmed for most of the cohorts. For example, for the cohort of women born in 1941, the probability of permanent retirement varied between 53% and 75%, depending on whether the unemployment rate in the ER was low or high. For men, the corresponding probabilities were 38% and 48%.

However, the difference in probability between regions with low unemployment, compared with those with high unemployment tended to decrease over time, from 21.2 percentage points for women born in 1941 to 8.7 for those born in 1946. For men, the gap was less pronounced, ranging from 11 percentage points for the cohort born in 1941 to close to zero. This decrease is largely a reflection of the general improvement in labour market conditions, and the convergence of unemployment rates across most ERs.

Despite this, other factors likely "push" workers towards retirement earlier than expected—such as poor health or losing one's job—had an even more significant effect on the probability of retiring before age 62. For men aged 61 who were still employed, the probability of having retired at this age was four times higher if the tax-filer had claimed the disability credit, while for women it was twice as high. People who had received employment insurance benefits during a given year were also much more likely to have retired before age 62, with women being three times more likely to retire, and men twice as likely.

These three factors are more strongly associated with involuntary retirement and with factors likely to push workers towards retirement, in many cases earlier than anticipated. The study also looked at the impact of other factors that are actually associated with "voluntary" retirement, such as long-standing union membership and having contributed to a pension plan for a minimum of five years. These factors are also associated with a higher probability of retiring before age 62, and their impact is more significant than that of unemployment rate.

Using a longitudinal database (the LAD), our results confirmed that there is a trend in delayed retirement. This trend was also observed in a previous study using the Labour Force Survey. It is important to note that the probability of retiring before age 62 is systematically lower among earlier cohorts, for both men and women. This finding shows that there is a fundamental shift toward delayed retirement as the baby boomers turn 50 years and older, reversing a trend of early retirement which had been observed among earlier cohorts.

Data sources, definitions and method

This article is based mainly on data from the Longitudinal Administrative Databank (LAD) from 1991 to 2011 as well as data from the Labour Force Survey (LFS), from 1976 to 2011, for comparison purposes (see **Measuring expected retirement age using LAD taxation data**).

LAD

The LAD contains a sample of 20% of T1 tax records which, at the time of the analysis, pertained to a period covering the years from 1982 to 2011. The LAD comes from an administrative source and does not contain many variables on the demographic and labour market characteristics of individuals, although it does contain a large number of observations over close to 30 years and a high level of detail regarding income sources. Because this database is longitudinal, it can be used to follow tax-filers over time and to observe transition-related phenomena, such as retirement.

Definitions of retirement

Retirement is a difficult concept to define, which explains why there are numerous definitions and a lack of real consensus to date. The definition that is chosen is often dictated by the research question and the database used. It is nonetheless possible to identify three main criteria on which definitions are generally based (Denton and Spencer 2008; Ekerdt and DeViney 1990):

1. Self-identification
2. The receiving of pension benefits
3. Reduction in work effort or employment earnings

Given the use of the LAD, which is based on administrative data sources, the self-identification criterion is ruled out, since no tax-filer can self-identify as retired. The fact that an individual is receiving pension benefits does not apply either, since this is merely an indication that a worker meets the eligibility criteria for a pension plan. A person could be receiving pension benefits, while maintaining a high level of labour force participation. We therefore used a criterion related to a reduction in employment earnings (in the absence of that of hours of work).

This study covers the years from 1991 to 2011 given that, prior to that period, the proportion of Canadians filing tax returns had been growing because of the introduction of certain tax credits (federal sales tax credit in 1986, goods and services tax credit in 1989, and child tax credit in 1991, which had an impact in the early 1990s). At the time this article was written, the last year the LAD data were available was 2011. In light of the strict definition of retirement used in this article, permanent retirements can be observed from 1991 to 2007.

We also adopted a concept of constant geography, which makes ERs comparable over time despite amalgamations, divisions and changes in geographic boundaries. The 2006 ER boundaries were used for the entire observation period.

The universe for this article encompasses people likely to retire, that is: individuals between the ages of 50 and 80 who had employment income at a given time during our observation period. Retirees are individuals who have gone from being employed (having an employment income[18] of over $5,000) in a given year to retired (having an employment income of $5,000 or under) the following year. For retirement to be considered "permanent", an individual's employment income must remain under the established threshold for a minimum of four years. This $5,000 threshold was set on the basis of the distribution of employment earnings in the LAD, and corresponds to the income that a person working no more than 10 hours a week for minimum wage could earn over a period of approximately one year. All monetary values were converted to 2011 dollars.

Deceased individuals were generally excluded, except when the death occurred after their "retirement" (after the decrease in their employment income to below the threshold that defines retirement).[19] In these cases only, the four-year minimum was not observed. The retirements of persons who died not long afterwards were included, given that death is more frequent at older ages, and eliminating them might understate expected working life. This approach is slightly different from that adopted in estimating the survival model, which allows for only two possible statuses: being employed or not.

Approximately 5% of tax-filers fail to file a tax return during a given year, or submit it late. Such returns are not included in the file that Statistics Canada receives. Therefore, for the purposes of this article, individuals are considered to be retired if they are included in the file during the five-year period used to determine their status as retired (the year in which they retired and the following four years). To be considered employed, an individual must be included in the file during the observation year, and must earn over $5,000.

In some cases, a person may have retired more than once. Although we tried to identify "permanent" retirement, we observed a certain number of instances in which persons identified as "retired" returned to the labour market. For example, approximately 10% of retirees in our sample returned to the labour market after the four-year period. If the minimum period of retirement

18. For employees, employment income refers to the income reported on the T4 form, and includes wages and commissions before deductions as well as other employment income; for example, tips, directors' fees and bonuses, as well as other components of income that have changed over time. For self-employed workers, employment income means gross income from self-employment. All dollar values have been converted to 2011 constant dollars.

19. A taxfiler who is deceased must, nonetheless, have been retired for at least a year to be considered retired.

from the labour force is reduced to two years, approximately 21% of retirees returned to the labour force.[20] When a tax-filer has retired more than once, all of the retirements were taken into account in calculating expected retirement age, to prevent downward bias in the retirement age.[21]

Calculation of expected working life

The calculation of expected working life at age 50 is similar to that for life expectancy at age 50, the main difference being that the probability of retirement is added to the probability of death. This gives the number of years spent in employment starting at age 50 if mortality and retirement rates for each age remain at their observed level in a given year.[22] In this article, retirement rates were also calculated using the LAD, while mortality rates come from the Canadian Human Mortality Database (Université de Montréal 2012).

Survival model to estimate probability of retirement

The survival model used is a multilevel logistic regression model (with fixed effects and random constants). For each year of age, the probability of permanent retirement, as defined in this article, is the event of interest estimated through the survival model. This binary model takes non-independence between observations into account by including, in addition to fixed effects, random constants for the individual (level 2) and the ER of residence (level 3). The effect of the independent variables is estimated at level 1, and the coefficients correspond to the fixed effects (transformed into predicted probabilities, maintaining the co-variables at their average value for the population of interest).

In this model, each year of age at which an employee is working represents an observation. An employee who did not retire during the period will therefore count for 12 observations in the model (the 12 "opportunities" that they would have had to take permanent retirement between age 50 and 61). Individuals who died during the period are excluded from the survival analysis as only two "statuses" are possible for them: remaining employed throughout the period, or retiring for four consecutive years.

Choosing the 'unemployment rate' variable

In this article, we have used the "unemployment rate" by ER variable to estimate the effect of local economic conditions on the probability of retirement. Other variables could have been included, for example the employment rate, which is also available by ER in the LFS. We did in fact attempt to do so by estimating the same model, while substituting the employment rate for the unemployment rate. The results were similar: for men born in 1941, the probability of retiring before age 62 went from 36% in regions with an 85% employment rate, to 57% in regions in which it was only 55%. We therefore observed a relationship similar to that obtained with the unemployment rate, but in the opposite direction; in ER with a higher employment rate (or a lower unemployment rate), the probability of retiring before age 62 was lower, and vice versa. For men born in 1946, the probabilities went from 38.5% to 31.9% for the same employment rates. Thus, a less significant effect was also observed, as we shifted to younger cohorts.

Although a single model, based on the unemployment rate has been presented, a number of versions were tested. For example, we verified whether the use of the unemployment rate for only the current year might have reduced the impact of this variable on the probability of retirement. We also tested different versions of the unemployment rate (an average of three years, and then an average of five years, with the years closer to the current year being weighted more heavily, and years further from the current year being given less weight, and also with no weighting at all). The results all proved very similar to those presented in this article.

Furthermore, we have also tried to use the unemployment rate for the population of interest (people aged 50 and over) in the model instead of the 20-to-49 age group. However, this variable could be linked to the one associated with the collection of employment insurance benefits and could create endogeneity. We then estimated the model with the variable relating to unemployment rate for the population aged 40 to 49, a group similar to the population of interest. This reduced the overall effect of the unemployment rate, which can be attributed to the volatility of this variable given that it is based on lower number of observations.

The final model used therefore focused on the unemployment rate of persons aged 20 to 49 (as a continuous variable) because this variable was representative of the overall strenght of local labour markets, and was based on a large number of observations. We also tested a grouped version of this variable, by combining ERs with low, moderate and high unemployment, which corresponded to the variable used in section 1. However, the level of detail for this variable suffered, in that ERs with a 16.5% unemployment rate may be in the same group as regions in which the rate is 11%, for example. Accordingly, this variable was much less significant. However, the results have been presented by category of unemployment rate (using simulation through the model). These categories vary according to the levels to which each cohort was exposed. In light of the overall improvement in employment conditions, unemployment rates for each category decreased for each cohort.

We also used interactive variables to test whether the effect of the unemployment rate on retirement varied according to age (for example, whether the effect was more significant for 61-year-olds than for people aged 55). However, these models did not reveal any such trends.

20. We note that these percentages represent an average of the returns observed between 1991 and 2002, given that we observe fewer and fewer returns as time passes. For example, retirees from 1991 have 16 years to return, whereas returns cannot be observed for those who retired in 2007. This represents the phenomenon of "right censorship".

21. Taking the first retirements of these individuals would have created downward pressure on the expected retirement age, whereas having taken only their most recent retirement would have created upward pressure on the expected retirement age.

22. For further information regarding the method of calculation, see Carrière and Galarneau (2011).

Measuring expected retirement age using LAD taxation data

Since the LAD does not contain any variables that could identify people who have retired, we established and compared various definitions of retirement, based on a range of employment earnings thresholds as well as employment earnings ratios. These results were compared with those obtained from the LFS.

Delayed retirement regardless of the definition

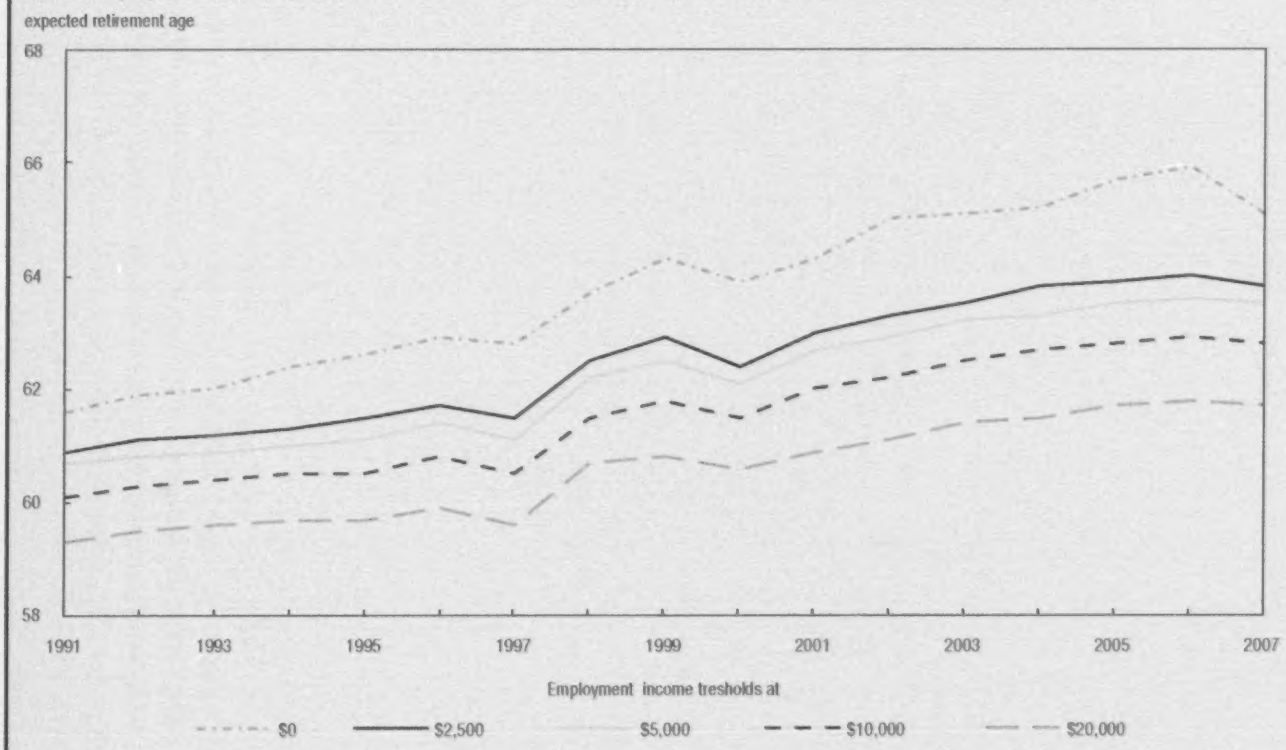
From the individuals likely to retire, who were represented in the LAD—people between the ages of 50 and 80, who were employed at some point between 1991 and 2007—we selected retirees; i.e., individuals who had gone from over $5,000 in employment income during a given year, to $5,000 or less in employment income the following year, and who maintained this level of employment income for a minimum of four years. These retirements were used to estimate retirement rates by age and sex, and, in the end, to calculate an expected retirement age (see **Data sources, definitions and method**).

A number of employment income thresholds were tested and all revealed similar trends, namely that there was a delay in retirement, but with varying levels of expected retirement ages. Although the findings reported here pertain solely to earnings thresholds, we also tested definitions that combined earnings thresholds and ratios. For example, for individuals to be considered as having retired, their employment earnings had to decrease below a certain threshold, and their earnings had to represent less than 10% of their average earnings during the five-year period preceding those received during the year of the deemed retirement. These definitions gave similar results, but forced us to eliminate certain individuals, given that we had to go back in time to establish the ratio and to eliminate the missing values.

Different retirement periods were also tested. We opted for retirement lasting at least four years, a choice that yielded results similar to those obtained through the LFS. We also tested other criteria, such as a retirement of at least two years. However, when this criterion was combined with a $5,000 threshold, it gave rise to a relatively high percentage of returns (over 20%), whereas with the four-year criterion, the proportion of returns decreased by half.

As we decreased the employment income threshold in the definition of retirement, the expected retirement age rose (Chart A.1). For example, a difference of nearly four years was observed in 2007, depending on whether the threshold varied from $0 to $20,000. Nonetheless, the trend observed between 1991 and 2007 remained more or less identical, regardless of the threshold that is used.

Chart A.1
As the employment income threshold in the definition of retirement decreases, the expected retirement age increases



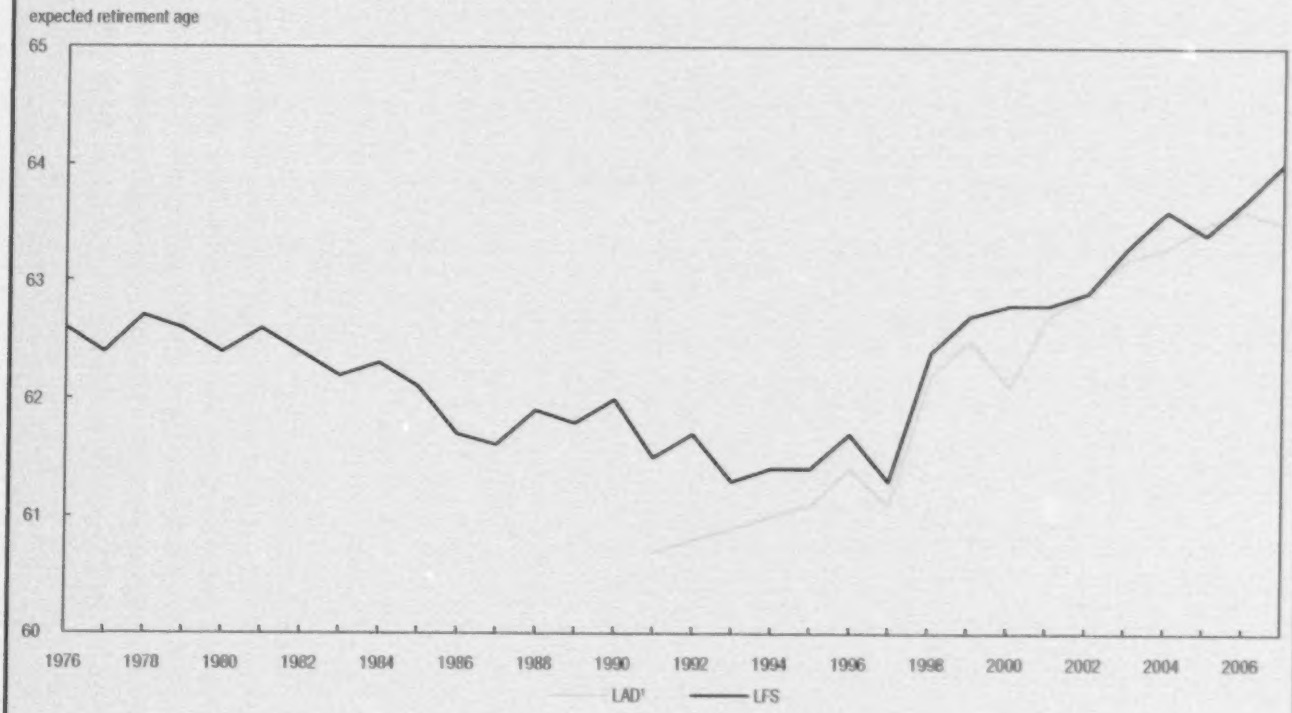
Source : Statistics Canada, Longitudinal Administrative Databank (LAD), 1991 to 2011.

The expected retirement age indicator is largely dependent on rates of retirement; when they increase, expected retirement age decreases (since the hypothetical starting cohort composed of individuals aged 50 ends earlier).[23] Decreasing the threshold reduces retirement rates as well, given that the number of jobs (the denominator for the retirement rate) then increases more quickly than the number of retirements (the numerator).

A trend comparable to that obtained with the LFS

The trends in expected retirement age obtained using the LAD were compared with those obtained from the LFS data. Through the LFS, it is possible to observe the expected retirement age for the period from 1976 to 2012.[24] Both data sources indicate a trend in delayed retirement (Chart A.2).[25] An average difference of approximately half a year separates the expected retirement age, calculated using the LFS, from that derived from the LAD (with a $5,000 threshold).

Chart A.2
Delay in retirement regardless of source and definition



1. With a $5,000 threshold of employment income.
Source : Statistics Canada, Longitudinal Administrative Databank (LAD), 1991 to 2011; Labour Force Survey (LFS), 1976 to 2009.

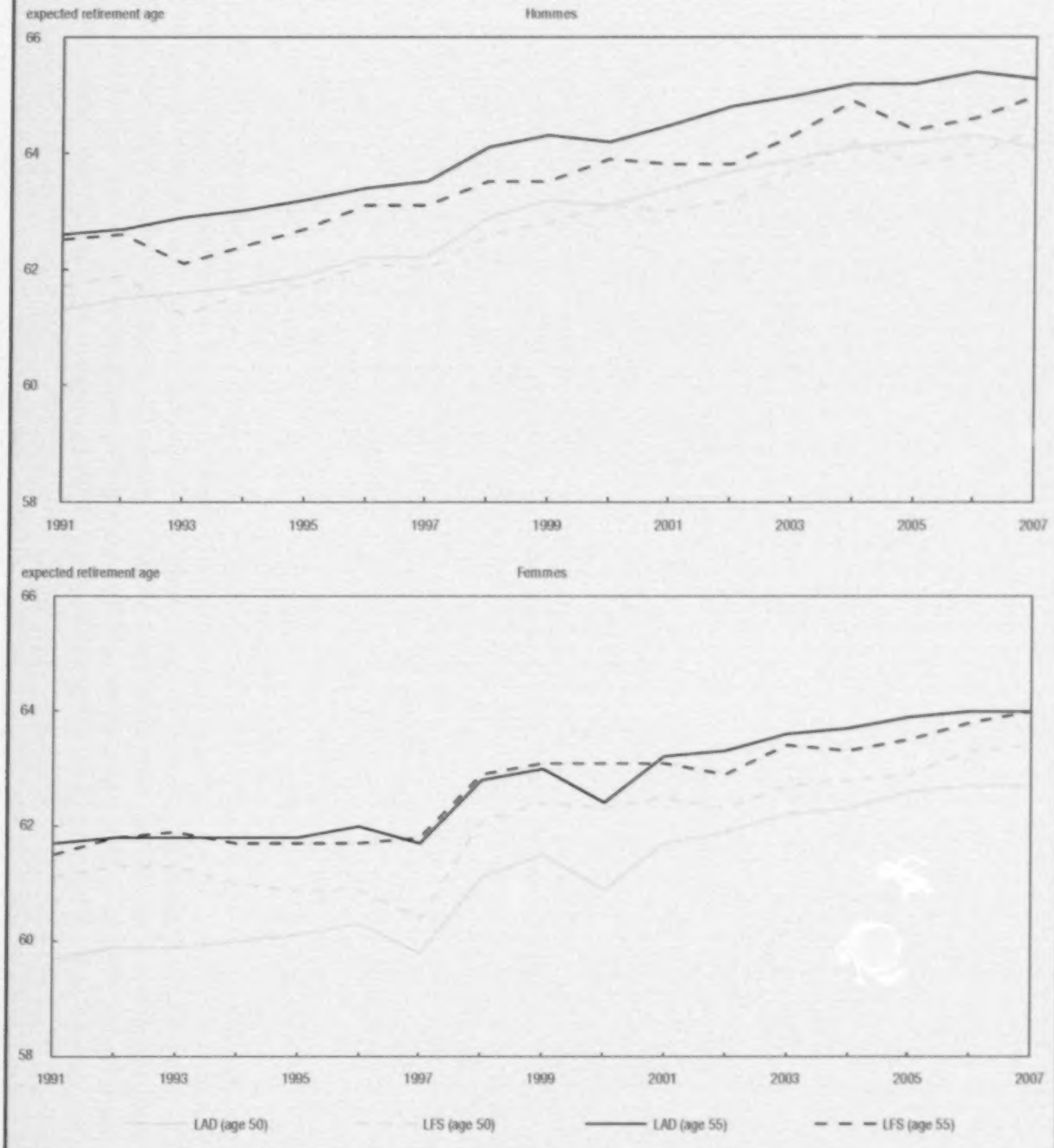
The difference is observed primarily for women (Chart A.3), a finding that could be explained by the fact that involuntary retirements are not included in the LFS before age 55, whereas they are included in the LAD by default. The effect is more pronounced for women because, before the age of 55, they are more likely than men to hold low-wage jobs which have higher turnover rates; women are therefore more likely to leave these jobs and be classified as retired. This increases the retirement rate of women and reduces their expected retirement age. The difference is more pronounced from 1991 to 1993, possibly because of the recession that took place in the early 1990s. The recession appears to have heightened the effect of involuntary retirements for women between the ages of 50 and 55. Nonetheless, the difference between the two sources disappears for women, when the expected retirement age is estimated at 55 years of age (instead of 50).

23. This relationship holds true for each year of age, but the effect of an increase in the rate of retirement is more significant if it occurs early; for example, in a person's fifties rather than the person's sixties or seventies, given that a larger number of years of potential employment are not included.

24. Even if the LFS data from 1976 to 2013 are used, the expected retirement age can be observed for only the period from 1976 to 2012, given that the LFS question designed to identify retirees during a particular year requires two years of observation. For further details regarding methodology, see Carrière and Galarneau (2011).

25. The LFS expected retirement age is estimated here on the basis of annual values, rather than three-year moving averages, as in Carrière and Galarneau (2011 and 2012). The indicator includes voluntary and involuntary retirements from 1976 to 2009. In the previous articles, involuntary retirements dated back to 1997, only because of a change in the question used to identify employment exits related to economic conditions in the LFS. Prior to 1997, involuntary retirements included a number of job terminations of seasonal workers, which cannot be considered retirements. To take this into account and show the series up to 1976, we selected only a percentage of job terminations arising from layoffs, from 1976 to 2009.

Chart A.3
The difference observed between the LFS and the LAD for women disappears when the indicator starts at age 55



Sources : Statistics Canada, Longitudinal Administrative Databank (LAD), 1991 to 2011; Labour Force Survey (LFS), 1991 to 2009.

For men, the difference between the LFS and the LAD is very low when the indicator is observed at age 50, but increases when it is observed at age 55. More jobs and retirements are identified through the LAD than through the LFS.[26] Despite some differences, the upward trend in the expected retirement age is a clear and observable finding, regardless of the source or the definition used.[27]

26. At age 50, the difference in the number of jobs and retirements is equivalent for men, meaning that retirement rates and expected retirement age are similar for both sources. The LAD identifies more jobs than retirements at age 55, compared with the LFS (thus bringing down the retirement rate and increasing the expected retirement age).

27. Denton, Finnie and Spencer, 2011, compared trends in retirement age by cohort, based on the LFS and the LAD, and also arrived at comparable results for the two databases.

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